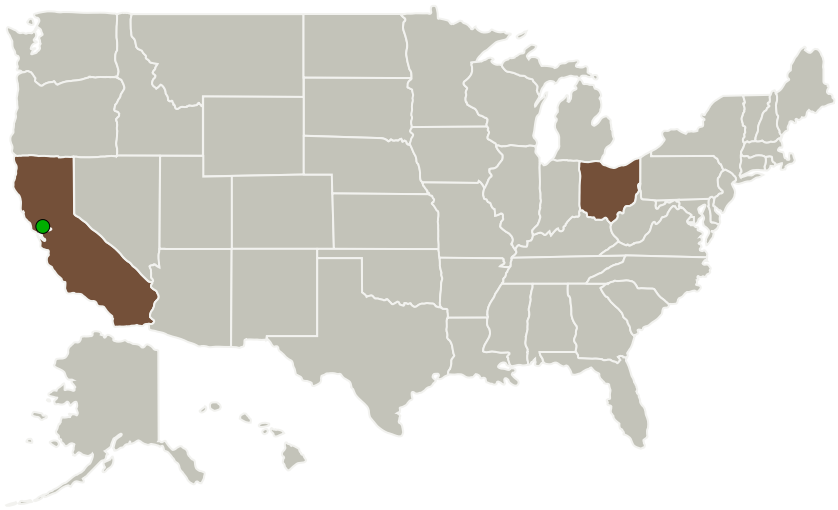
Affordable Resins for High-Performance, Ablative Thermal Protection Systems, Phase I

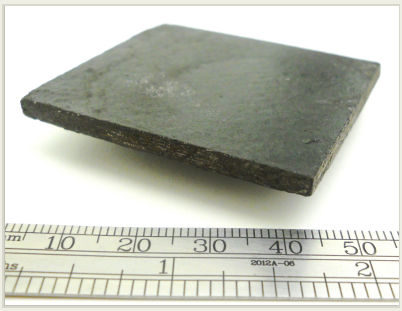
Completed Technology Project (2014 - 2014)

Project Introduction

Cornerstone Research Group Inc. (CRG) proposes to advance fundamental material development of a high-temperature resistant, multifunctional polymer system conceived and demonstrated previously by CRG, which will provide NASA with an innovative, low-cost material for thermal protection systems. The proposed material technology results in a polymer system that transitions from a thermoplastic at temperatures below 230F, to a thermoset at temperatures above 230F, and finally to a graphite-like material at higher temperatures. CRG has demonstrated the concept and feasibility of this material, trademarked as Metagraphite, during a previous research effort. In that effort, CRG confirmed that bulk thermo-mechanical, thermal, and electrical properties of the polymer could be altered through the application of varying amounts of heat. The described polymer can be combined with fabric reinforcement to create a system that presents NASA with the potential for low-cost, adaptive structural materials with properties ranging from those of thermoplastics to carbon matrix composites. Such materials would find wide use in thermal protection systems and high-temperature components for launch propulsion system rocket nozzles. The extremely low-cost raw materials and the range of material properties available will enable innovative processing methods and reduced component manufacturing costs when compared with state-of-the-art materials.

Primary U.S. Work Locations and Key Partners





Affordable Resins for High-Performance, Ablative Thermal Protection Systems Project Image

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Organizations Performing Work	Role	Type	Location
Cornerstone Research Group, Inc.	Lead Organization	Industry	Miamisburg, Ohio
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Ohio

Project Transitions

June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137531)*

Images

Project Image
Affordable Resins for High-Performance, Ablative Thermal Protection Systems Project Image *(https://techport.nasa.gov/image/131869)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Cornerstone Research Group, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

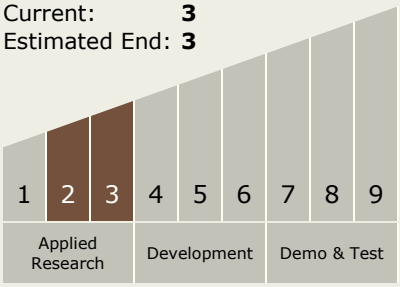
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Richard D Hreha

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.3 Thermal Protection Components and Systems
    - TX14.3.1 Thermal Protection Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System